



Beams Division
Mechanical Support Department

MSD Note MSDN-ME-000036

NuMI Stubout Magnets and Magnet Stands Installation Plan

Author - Rob Reilly _____

Date 7-7-03
Rev. 7-24-03
Rev. 7-31-03
Rev. 8-11-03
Rev. 8-13-03

Reviewer - Joel Misek _____

Date Reviewed _____

Abstract - This document describes all work tasks and related hazards involved with installing magnet stands and magnets in the NuMI stubout beamline from magnet HQ108 through HQ112 inclusive.

NuMI Stubout Magnets and Magnet Stands Installation Plan

This document describes all work tasks and related hazards involved with installing magnet stands and magnets in the NuMI stubout beamline from magnet HQ108 through HQ112 inclusive.

Reference Drawings

8875.119-ME-431093 Magnet and Magnet Stands Layout

8875.119-ME-427310 Magnet Stands Installation

Equipment List

Magnet Mover – 36,000 # capacity, Serial #26259 made by Elwell Parker

Upper Monorail Hoists – two electric motorized, pendant operated, of 7.5 ton capacity each, Yale model CEW7.5x18R8S4, with a connecting tie bar provided by the monorail installation subcontractor, which maintains the hook spacing at 10 ft.

Lower Monorail Hoist – one 6 ton capacity manually operated, Yale LTG Geared Army Type Trolley Hoist, model 925-14500S

Magnet Tugger – Allis-Chalmers model FE 80-24, provided by FNAL-BD-MSD

Magnet moving dollies – FNAL dwg. MD-305872, provided by FNAL-BD-MSD

Nylon slings – provided by FNAL-BD-MSD

Cribbing – provided by FNAL-BD-MSD

Hammer drill & concrete bits – provided by FNAL-BD-MSD

Hand Tools - provided by FNAL-BD-MSD and Rigging subcontractor

Hazards

1. Lifting heavy loads with cranes in MI-60 and the NuMI Stub – The upper monorail hoists are tied together with a link bar. The B-2 magnets are lifted by two hoists lifting together, and the magnet is kept level except when setting it down on the uneven stands, or lifting it off the stands. Since the HQ110 magnet can only be lifted by one hoist, and must be set down on uneven stands, the upstream adjusters must be run down to low position and the downstream adjusters to high position before the magnet is set down or lifted off. On the upper monorail the hoists travel by electric power, but on the lower monorail the hoist is moved by pulling on a chainfall. Proper slings in good condition must be provided.
2. Welding – A welding permit from the FNAL Fire Department is required.
3. Drilling concrete – The concrete dust must be vacuumed out of the holes.

4. Climbing ladders – Some stand assembly work and unhooking slings may need to be done on a step ladder. Rolling platform ladders can be provided if deemed necessary.
5. Mechanical work with hand tools and hydraulic jacks – some of the magnets must be moved on roller trolleys using hydraulic jacks for side motion, then for lifting when placing shims. Care must be taken when moving them so they remain under control.

Tasks

Surveying and marking floor

The alignment crew will perform the following tasks:

1. Survey the entire stub tunnel, install tie rods and monuments, note floor elevations.
2. Mark a chalk beamline on the floor.
3. Mark locations of magnet end centers on the floor.
4. Mark locations of magnet centerline end elevations on both walls.

Installing Stands and Magnets

The project engineer will perform the following tasks:

5. Mark magnet stand positions on the floor.
6. Designate magnet serial numbers and orientation.

The ironworker crew will perform the following tasks:

7. At MI-60, disassemble magnet stands A, B, C and D as necessary to get them through the tunnel.
8. Bring all magnet stands, ACME adjuster assemblies and related hardware on carts from MI-60 to the stub tunnel.
9. Drill holes and set anchors for two HQ112 stands G & F, dwg. no.s MC-427921 & 427920. Install stands G & F, using 3/4" bolts as jacks to raise them approximately 1" and level with 3' bubble level, and packing grout underneath the feet.
10. Drill holes and set anchors for HQ111 d/s stand E, dwg. no. MC-427919. Install stand E, using 3/4" bolts as jacks to raise it approximately 1" and level with 3' bubble level, and packing grout underneath the feet.

11. Drill holes and set anchors for HQ111 u/s stand Wall Bracket, dwg. no. MD-427853, deleting 2 anchors shown on dwg that are too close to edge of concrete. Install wall bracket stand, adding a support leg not shown on dwg.
12. Set four ACME adjuster assemblies ME-427723 on four stands and weld them in place. Fillet welds each side 1/4" leg x 1" long on 6" centers. Set ACME's to approx. center of travel in each direction, including vertical.
13. Drill holes and set anchors for magnet transfer channel structure per dwg. ME-406291 sheet 2 detail J. Set up magnet transfer channel structure.
14. Bring HQ112 magnet from MI-60 on low dolly. Magnet weight is approx. 6890#. Attach 9 degree Downstream Weldment MD-427530 and 9 degree Upstream Weldment MD-427532, and screw in ball feet. Magnet weight with attachments is approx. 7000#. Lift with the downstream hoist on the first monorail using nylon slings. Set magnet on transfer channels. Use jacks to slide magnet over 27" to second monorail. Lift with second monorail hoist using nylon slings. Set HQ112 magnet on ACME adjusters.
15. Bring HQ111 magnet from MI-60 on low dolly. Attach 9 degree Downstream Weldment MD-427530 and 9 degree Upstream Weldment MD-427532, and screw in ball feet. Lift with the downstream hoist on the first monorail using nylon slings. Set magnet on transfer channels. Use jacks to slide magnet over 27" to second monorail. Lift with second monorail hoist using nylon slings. Set HQ111 magnet on ACME adjusters.
16. Remove magnet transfer channel structure and store it in the lower tunnel.
17. Drill holes and set anchors for stand R, dwg. no. MC-427974. Install stand R, with cart track weldment MC-427932, using 3/4" bolts as jacks to raise it approximately 1/4" and level with 3' bubble level, and packing grout underneath the feet.
18. Assemble magnet stand D, dwg. no. MD-427852, with two cart track weldments MC-427932.
19. Drill holes and set anchors for stand D. Install stand D, using 3/4" bolts as jacks to raise it approximately 3/4" and level with 3' bubble level, and packing grout underneath the feet.
20. Assemble magnet stand C, dwg. no. MD-427846, with two cart track weldments MC-427932.
21. Drill holes and set anchors for stand C. Install stand C, using 3/4" bolts as jacks to raise it approximately 3/4" and level with 3' bubble level, and packing grout underneath the feet.
22. Assemble magnet stand B, dwg. no. MD-427813, with two cart track weldments MC-427932.
23. Drill holes and set anchors for stand B. Install stand B, using 3/4" bolts as jacks to raise it approximately 1/2" and level with 3' bubble level, and packing grout underneath the feet.

24. Assemble magnet stand A, dwg. no. MD-427781, with two cart track weldments MC-427931.
25. Drill holes and set anchors for stand A. Install stand A, using 3/4" bolts as jacks to raise it approximately 5/16" and level with 3' bubble level, and packing grout underneath the feet.
26. Drill holes and set anchors for two stand P plates, dwg. no. MC-427971. Do not set stand plates yet because they would be in the way. They are installed in step 32.
27. Set ten ACME adjuster assemblies ME-427723 on ten trolley carts MD-427957 and weld them in place per dwg. MD-431090. Set ACME's to approx. center of travel in each direction, including vertical. Set nine trolleys on nine stands using monorail crane. The tenth trolley is not installed until stand P is in place in step 32.
28. At MI-60, roll B2 magnet V108-6, install yoke weldments MC-427316 in correct orientation. Screw in ball feet. Magnet weight 25254#, yoke weldments 427# each plus eight bolts and four ball feet, combined weight approx. 26150#. Bring B2 magnet V108-6 from MI-60 on low dollies, bus work at u/s end. Lift with both hoists on first monorail using nylon slings. Set magnet on ACME adjusters. Roll magnet toward wall to beamline position. Jack up trolleys and slide shim blocks under them, then lower trolleys onto blocks.
29. At MI-60, roll B2 magnet V108-5, install yoke weldments MC-427314 in correct orientation. Screw in ball feet. Bring B2 magnet V108-5 from MI-60 on low dollies, bus work at u/s end. Lift with both hoists on first monorail using nylon slings. Set magnet on ACME adjusters. Roll magnet toward wall to beamline position. Jack up trolleys and slide shim blocks under them, then lower trolleys onto blocks.
30. Bring HQ110 magnet from MI-60 on low dolly. Magnet weight is approx. 3600#. Attach 6 degree Downstream Weldment MD-427528 and 6 degree Upstream Weldment MD-427529, and screw in ball feet. Magnet weight with attachments is approx. 3700#. Lift with one hoist on first monorail using nylon slings. Turn upstream ACME adjusters down to low position and downstream ACMEs to up high position. Set magnet on ACME adjusters. Roll magnet toward wall to beamline position. Jack up trolleys and slide shim blocks under them, then lower trolleys onto blocks. Turn ACME adjusters so magnet is approximately at correct angle and height relative to marks on wall.
31. At MI-60, roll B2 magnet V108-4, install yoke weldments MC-427312 in correct orientation. Screw in ball feet. Bring B2 magnet V108-4 from MI-60 on low dollies, bus work at u/s end. Lift with both hoists on first monorail using nylon slings. Set magnet on ACME adjusters. Roll magnet toward wall to beamline position. Jack up trolleys and slide shim blocks under them, then lower trolleys onto blocks.
32. At MI-60, roll B2 magnet V108-3, install yoke weldments MC-427308 in correct orientation. Screw in ball feet. Bring B2 magnet V108-3 from MI-60 on low

- dollies, bus work at u/s end. Lift with both hoists on first monorail using nylon slings. Because the hoist lift is not high enough, the magnet cannot be set directly on its u/s stand. Set d/s end of magnet on d/s ACME adjusters, and u/s end on cribbing. Jack up the u/s end until the MC-427971 stand P plates will slide under it, then install the stand P plates, using 3/4" bolts to raise them approximately 1" and level with 3' bubble level, and packing grout underneath. Install cart track MC-427932 and trolley cart assy on stand plates. Jack up magnet and remove cribbing to set magnet on u/s ACME adjusters. Roll magnet toward wall to beamline position. Jack up trolleys and slide shim blocks under them, then lower trolleys onto blocks.
33. Drill holes and set anchors for HQ109 stands M & N, dwg. no.s MC-427926 & 427927. Install stands M & N, using 3/4" bolts as jacks to raise it approximately 1" and level with 3' bubble level, and packing grout underneath the feet.
 34. Set two ACME adjuster assemblies ME-427723 on two stands and weld them in place. Fillet welds each side 1/4" leg x 1" long on 6" centers. Set ACME's to approx. center of travel in each direction, including vertical.
 35. Bring HQ109 magnet from MI-60 on Elwell-Parker magnet mover vehicle. Attach 3 degree Downstream Weldment MD-427526 and 3 degree Upstream Weldment MD-427527, and screw in ball feet. Set magnet on ACME adjusters.
 36. Drill holes and set anchors for B2 magnet V108-2 stands K & L, dwg. no.s MC-427924 & 427925. Install stands K & L, using 3/4" bolts as jacks to raise it approximately 1" and level with 3' bubble level, and packing grout underneath the feet.
 37. Set two ACME adjuster assemblies ME-427723 on two stands and weld them in place. Fillet welds each side 1/4" leg x 1" long on 6" centers. Set ACME's to approx. center of travel in each direction, including vertical.
 38. At MI-60, roll B2 magnet V108-2, install yoke weldments MC-427306 in correct orientation. Screw in ball feet. Bring B2 magnet V108-2 from MI-60 on Elwell-Parker magnet mover vehicle, bus work at u/s end. Set magnet on ACME adjusters.
 39. Drill holes and set anchors for B2 magnet V108-1 stands H & J, dwg. no.s MC-427922 & 427923. Install B2-1 stands, using 3/4" bolts as jacks to raise it approximately 1" and level with 3' bubble level, and packing grout underneath the feet.
 40. Set two ACME adjuster assemblies ME-427723 on two stands and weld them in place. Fillet welds each side 1/4" leg x 1" long on 6" centers. Set ACME's to approx. center of travel in each direction, including vertical.
 41. At MI-60, roll B2 magnet V108-1, install yoke weldments MC-427304 in correct orientation. Screw in ball feet. Bring B2 magnet V108-1 from MI-60 on Elwell-Parker magnet mover vehicle, bus work at u/s end. Set magnet on ACME adjusters.

42. Drill holes and set anchors for HQ108 stands, type E, dwg. no. MC-427919. Install HQ108 stands, using 3/4" bolts as jacks to raise it approximately 1" and level with 3' bubble level, and packing grout underneath the feet.
43. Set two 1" shim plates and two ACME adjuster assemblies MD-305757 on two stands and weld them in place. Fillet welds each side 1/4" leg x 1" long on 6" centers. Set ACME's to approx. center of travel in each direction, including vertical.
44. Bring HQ108 magnet from MI-60 on Elwell-Parker magnet mover vehicle. Screw in ball feet. Set magnet on ACME adjusters.
45. Misc. cleanup

Surveying & Aligning Magnets

46. Alignment crew surveys and aligns all magnets.

End